

PATENT APPLICATION

In re Application of:

Examiner: R. Mack

Group Art Unit: 2873

June 21, 2001

For: HEAD-UP DISPLAY DEVICE  
WITH ROTATIONALLY  
ASYMMETRIC CURVED  
SURFACE (AS AMENDED)

Commissioner for Patents  
Washington, DC 20231

REQUEST FOR INTERFERENCE

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Sir:

Claims 11 through 124 are pending, with claims 11,

27, 43 and 45 being independent.

27, 43 and 45 being independent.

Pursuant to 37 CFR 1.607, Applicants respectfully request that an interference be declared involving all claims, i.e., Claims 11 through 124, of the present application of Shoichi Yamazaki, et al. ("Yamazaki") and at least Claims 1 through 10, 12 through 14, 16, 17, 22 through 29, and 20 through 42 of U.S. Patent No. 6,018,423 ("Takahashi '423") to Koichi Takahashi ("Takahashi").

A. Introduction

A. Introduction

As noted in the Preliminary Amendment filed January 25, 2001, the Yamazaki claims have been copied in modified

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form from Takahashi Claims 1 through 14, 16, 17, and 22 through 40.

B. The counts

Applicants respectfully propose that the interference be declared with four counts. The proposed counts are set forth as follows:

COUNT 1

An optical system comprising a prism member,  
wherein said prism member has a first surface and a second surface, which face each other across a medium, so that light rays entering said prism member are reflected at least twice in said prism member,

wherein both said first surface and said second surface are curved surface configurations, and at least one of the curved surface configurations is formed from a rotationally asymmetric curved surface.

COUNT 2

An optical system comprising a prism member,  
wherein said prism member has a first surface and a second surface, which face each other across a medium, so that light rays entering said prism member are reflected at least twice in said prism member,

wherein both said first surface and said second surface are curved surface configurations, and at least one of the curved surface configurations is formed from a rotationally asymmetric curved surface,

wherein a third surface is formed from said rotationally asymmetric curved surface.

#### COUNT 3

An optical system comprising a prism member, wherein said prism member has a first surface and a second surface, which face each other across a medium, so that light rays entering said prism member are reflected at least twice in said prism member,

wherein both said first surface and said second surface are curved surface configurations, and at least one of the curved surface configurations is formed from a rotationally asymmetric curved surface,

wherein said first surface is formed from a configuration having a concave surface directed toward the outside of said medium.

#### COUNT 4

An optical system comprising a prism member, wherein said prism member has two surfaces having a reflecting action to reflect light in said prism member, and two surfaces having a transmitting action to transmit light, and

wherein said prism member has at least one rotationally asymmetric curved surface.

It will be appreciated that the four counts have been formulated upon the basis of various Yamazaki claims, as shown by the following Table A:

TABLE A

| Count | Yamazaki claim upon which count is based   |
|-------|--|
| 1     | 45   |
| 2     | 45, modified to incorporate the features of Claim 55 but omitting intervening Claim 52 |
| 3     | 45, modified to incorporate the features of Claim 57 but omitting intervening Claim 52 |
| 4     | 43   |

C. Correspondence of claims to counts

1. Summary

Applicants respectfully submit that the claims correspond to the counts as shown in the following Table B:

TABLE B

| Count | Claims corresponding to count  |
|-------|--|
| 1     | Yamazaki Claims 11-19, 21, 23-36, 39-42, 45-54, 56, 58-74, 76, 78-91, 94-97, 100-109, 111, and 113-124, and Takahashi Claims 1-9, 11, 13, 14, 16, 17, 22-32, and 35-38 |
| 2     | Yamazaki Claims 20, 37, 55, 75, 92, and 110, and Takahashi Claims 10 and 33  |
| 3     | Yamazaki Claims 22, 38, 57, 77, 93, and 112, and Takahashi Claims 12 and 34  |

2. Detailed explanation of claim correspondence

a. Count 1

Applicants respectfully submit that Yamazaki Claims 11-19, 21, 23-36, 39-42, 45-54, 56, 58-74, 76, 78-91, 94-97, 100-109, 111, and 113-124, and Takahashi Claims 1-9, 11, 13, 14, 16, 17, 22-32, and 35-38 correspond to Count 1 as follows:

(1) Yamazaki Claim 45

Yamazaki Claim 45 is identical to Count 1.

(2) Yamazaki Claims 46 through 51 and 62

Yamazaki Claims 46 through 49 differ from Count 1 in that they further variously recite one or more of the following features:

- (a) that the prism member has a third surface which faces the first and second surfaces across the medium (Yamazaki Claim 46);
- (b) that the prism member is arranged so that both the first and second surfaces have a reflecting action, and the third surface has a transmitting action (Yamazaki Claim 47);
- (c) (1) that the first surface has both a transmitting action and a reflecting action

- (Yamazaki Claim 48), and (2) that such is effected by way of total reflection (Yamazaki Claim 49);
- (d) that the prism member has a mirror coating so as to have a reflecting action (Yamazaki Claim 62);
  - (e) that the light enters the prism member through the first surface, is reflected by the second surface and further reflected by the first surface, and exits through the third surface (Yamazaki Claim 51); and
  - (f) that the light enters the prism member by passing through the third surface, is reflected by the first surface and the second surface, and exits through the first surface (Yamazaki Claim 50).

As to features (a), (b), and (c)(1), Applicants respectfully submit that providing a first surface with transmitting and reflecting action, a second surface with reflecting action, and a third surface with transmitting action was known in the art as shown by U.S. Patent No. 5,640,632 (Koyama, et al.) (e.g., Figs. 7 and 10) or European Patent Document 0 408 344 (Staveley) (e.g., Figs. 7-10).

With respect to feature (c)(2), Applicants submit that it was known in the art to effect reflection using internal reflection, as shown by Koyama, et al. (e.g., col. 7, lines 33 and 53) or Staveley (e.g., col. 6, line 35).

With respect to feature (d), Applicants submit that it was known in the art to effect reflection using a mirror, as shown by U.S. Patent No. 5,594,588 (Togino '588) or Japanese Laid-Open Patent Application 5-303056 ("JP '056"). See also U.S. Patent No. 4,322,135 (Freeman), which shows, e.g., the use of silvering at col. 4, line 44.

With respect to feature (e), Applicants submit that it was known in the art to have light enter a prism member through a first surface, be reflected by the second and first surfaces, and exit through a third surface, as shown by Staveley (e.g., Figs. 8 and 10) or Koyama, et al. (e.g., Figs. 7 and 10).

With respect to feature (f), Applicants submit that it was known in the art to have light enter a prism member through a third surface, be reflected by first and second surfaces, and exit through the first surface, as shown by Staveley (e.g., Fig. 7).

In view of the foregoing, Applicants respectfully submit the claims would have been obvious over Count 1 in view of the art shown in the following Table C:

TABLE C

| Yamazaki Claims | Cited documents   |
|-----------------|---|
| 46-49           | <u>Koyama, et al.</u> or <u>Staveley</u>  |
| 62              | <u>Koyama, et al.</u> or <u>Staveley</u> , and any of <u>Togino</u> '588, JP '056, and <u>Freeman</u> |
| 51              | <u>Koyama, et al.</u> or <u>Staveley</u>  |
| 50              | <u>Staveley</u>   |

- (3) Yamazaki Claims 52 through 54, 56, 58 through 61, 64, 65, and 122

Yamazaki Claims 52 through 54, 56, 58 through 61, 64, 65, and 122, differ from Count 1 in the aspects discussed above with respect to Yamazaki Claims 45 through 51 from which they depend, and further in that they variously require one or more of the following features:

- (a) that the rotationally asymmetric curved surface is formed from a configuration having an aberration correcting action to correct decentration aberrations caused by reflection in the prism member (Yamazaki Claim 52);
- (b) that the first surface is formed from a rotationally asymmetric curved surface having an aberration correcting action to correct decentration aberrations caused by reflection in the prism member, so that light is subjected to the aberration correcting action when passing through the first surface and is also subjected to the aberration correcting action when reflected by the first surface (Yamazaki Claims 61 and 65);
- (c) that the second surface is formed from the rotationally asymmetric curved surface (Yamazaki Claim 53);



- (d) that the first surface is formed from the rotationally asymmetric curved surface (Yamazaki Claim 54);
- (e) that the prism member is provided with a mirror coating so as to have a reflecting action (Yamazaki Claim 56);
- (f) that the second surface is formed from a configuration having a concave surface directed toward the medium (Yamazaki Claim 58);
- (g) that the horizontal field angle is different from (Yamazaki Claim 59) or larger than (Yamazaki Claim 60) the vertical field angle;
- (h) that there is an optical member (Yamazaki Claim 64) having two refractive surfaces (Yamazaki Claim 122) disposed closer to an object than the prism member.

As to features (a) and (b), Applicants respectfully submit that it was known in the art to form a rotationally asymmetric curved surface so as to address trapezoidal distortion of an eccentric system, as shown by Togino '588 (e.g., col. 4, lines 39-46).

As to features (c) and (d), Applicants submit that such are met by the limitation of Count 1 that the first and second surfaces are curved surface and configurations and "at least one" of the curved surface configurations is formed from a rotationally asymmetric surface.

As to feature (e), Applicants submit that the use of mirrors was known in the art, as shown by Togino '588, and the use of silvering was known in the art as shown by Freeman, discussed above.

As to feature (f), Applicants submit that it was known in the art to make the second surface concave, as shown by Staveley (e.g., Figs. 7 and 9).

As to feature (g), Applicants respectfully submit that it was known in the art that the horizontal field angle is generally greater than the vertical field angle. Applicants refer in this regard to Togino '588, which mentions viewing angles of 15 degrees horizontal vs. 10 degrees vertical at, e.g., col. 2, lines 2 through 5.

As to feature (h), Applicants respectfully submit that it was known in the art to provide a lens closer to an object than a prism member, as shown by Koyama, et al. (wherein lenses 2a and 2b are closer to the object than prism unit 3 in Fig. 1) or Staveley (wherein lens arrangement 65 is closer to source 67 than eyepiece 50 in Figs. 7 and 8).

Accordingly, for these reasons and the reasons advanced above with respect to Yamazaki Claims 45 through 51 from which they depend, Applicants respectfully submit that Yamazaki Claims 52 through 54, 56, 58 through 61, 64, 65, and 122, would have been obvious over Count 1 in view of the art discussed above with respect to Yamazaki Claims 45 through 51, and further in view of the documents listed in the following Table D:

TABLE D

| Yamazaki Claims    | Additional cited documents                        |
|--------------------|---|
| 52, 53, 54, 61, 65 | <u>Togino '588</u>                                |
| 56                 | <u>Togino '588, or Togino '588 with Freeman</u>   |
| 58                 | <u>Togino '588 and Staveley</u>                   |
| 59, 60             | <u>Togino '588</u>                                |
| 64, 122            | <u>Togino '588 and Koyama, et al. or Staveley</u> |

- (4) Yamazaki Claims 11 through 19, 23 through 26, 63, and 121; Yamazaki Claims 27 through 36 and 39 through 42; and Takahashi Claims 1 through 9, 11, 13, 14, 16, 17, 22 through 32, and 35 through 38

Yamazaki 11 through 19, 23 through 26, 63, and 121, Yamazaki Claims 27 through 36 and 39 through 42, and Takahashi Claims 1 through 9, 11, 13, 14, 16, 17, 22 through 32, and 35 through 38 are respectfully submitted by Applicants to be analogous to Yamazaki Claims 45 through 54, 56, 58 through 62, 64, 65, and 122 (hereinafter the "Base Claims") as shown in the following Table E, and therefore should correspond to Count 1.

TABLE E

| Yamazaki Claim<br>("Base Claims") | Yamazaki<br>Claim | Yamazaki<br>Claim | Takahashi<br>Claim | Takahashi<br>Claim |
|-----------------------------------|-------------------|-------------------|--------------------|--------------------|
| 45                                | 11                | 28                | 1                  | 23                 |
| 46                                | 12                | 28                | 2                  | 24                 |
| 47                                | 13                | 29                | 3                  | 25                 |
| 48                                | 14                | 30                | 4                  | 26                 |
| 49                                | 15                | 32                | 5                  | 28                 |
| 50                                |                   | 31                |                    | 27                 |

|         |         |    |    |    |
|---------|---------|----|----|----|
| 51      | 16      |    | 6  |    |
| 62      |         | 42 |    | 38 |
| 52      | 17      | 34 | 7  | 30 |
| 53      | 18      | 35 | 8  | 31 |
| 54      | 19      | 36 | 9  | 32 |
| 56      | 21      |    | 11 | 34 |
| 58      | 23      | 39 | 13 |    |
| 64, 122 | 63, 121 |    | 14 |    |
| 59      | 24      | 40 | 16 | 36 |
| 60      | 25      | 41 | 17 | 37 |
| 61, 65  | 26      | 33 | 22 | 29 |

To explain the analogy, the claims in question are similar to the Base Claims but differ in a few aspects that Applicants respectfully submit do not affect their correspondence to Count 1, namely:

(a) the preamble: Yamazaki Claims 11 through 19, 23 through 26, 63, and 121, and Takahashi Claims 1 through 9, 11, 13, 14, 16, 17, and 22 recite an "image-forming optical system which forms an image of an object", and Yamazaki Claims 27 through 36 and 39 through 42, and Takahashi Claims 23 through 32 and 35 through 38 recite an "ocular optical system arranged to lead an image formed on an image plane to an observer's eyeball", whereas the Base Claims are directed to an "optical system"; however, Applicants respectfully submit that these differences do not constitute a patentable distinction with respect to the count;

(b) the refractive index limitation: all of the Takahashi Claims recite that the refractive index of the

medium is greater than one, which Applicants respectfully submit does not constitute a patentable distinction over the recitation in the count that the first and second surfaces face each other across the medium;

(c) the lens limitation: Takahashi Claim 14 recites a lens whereas Yamazaki Claims 64 and 122 recite an optical member, and an optical member having two refractive surfaces, respectively; however, Applicants respectfully submit that Takahashi Claim 14 should correspond to Count 1 for reasons analogous to those advanced for Yamazaki Claims 64 and 122.

(d) the double effect limitation: Takahashi Claim 22 includes a "whereby" limitation stating that a "double effect is produced by one surface", which Applicants respectfully submit has no patentable weight with respect to the claim correspondence.

(5) Yamazaki Claims 66 through 74, 76, 78 through 91, 94 through 97, 100 through 109, 111, 113 through 120, 123, and 124

Yamazaki Claims 66 through 74, 76, 78 through 91, 94 through 97, 100 through 109, 111, 113 through 120, 123, and 124 differ from Count 1 in the aspects discussed above with respect to Yamazaki Claims 11 through 19, 21, 23 through 36, 39 through 42, 45 through 54, 56, 58 through 65, 121, and 122 from which they depend, and further in that the claims recite acrylic resin or glass as the medium. However, Applicants respectfully submit that the use of plastic and glass materials was known in the art. (See, e.g., U.S.

Patent No. 4,775,217 (Ellis), which shows, e.g., use of glass or plastics at col. 3, lines 66-67, and Ingleton, which shows, e.g., use of plastic at col. 2, line 40.) For this reason, and the reasons advanced above with respect to Yamazaki Claims 11 through 19, 21, 23 through 36, 39 through 42, 45 through 54, 56, 58 through 65, 121, and 122, Applicants submit that Yamazaki Claims 66 through 74, 76, 78 through 91, 94 through 97, 100 through 109, 111, 113 through 120, 123, and 124 would have been obvious over Count 1 in view of the art.

b. Count 2

Applicants respectfully submit that Yamazaki Claims 20, 37, 55, 75, 92, and 110, and Takahashi Claims 10 and 33 correspond to Count 2, as follows:

(1) Yamazaki Claim 55

Yamazaki Claim 55 differs from Count 2 in that Yamazaki Claim 55 further requires that the rotationally asymmetric curved surface is formed from a configuration having an aberration correcting action to correct decentration aberrations caused by reflection in the prism member. However, Applicants respectfully submit that it was known in the art to form a rotationally asymmetric curved surface so as to address trapezoidal distortion of an eccentric system, as discussed above with reference to Togino '588. Accordingly, Applicants respectfully submit that

Yamazaki Claim 55 would have been obvious over Count 2 in view of Togino '588.

(2) Yamazaki Claims 20 and 37 and Takahashi Claims 10 and 33

Yamazaki Claims 20 and 37 and Takahashi Claims 10 and 33 differ from Count 2 in the aspects discussed above with respect to Yamazaki Claim 55 and further in that they differ in the preamble (with Yamazaki Claim 20 and Takahashi Claim 10 reciting an "image-forming system which forms an image of an object", and Yamazaki Claim 37 and Takahashi Claim 33 reciting an "ocular optical system arranged to lead an image formed on an image plane to an observer's eyeball", whereas the count recites an "optical system"), and in that Takahashi Claims 10 and 33 recite that the refractive index is greater than one. However, for reasons advanced above, Applicants submit that these are distinctions without a patentable difference; accordingly, Applicants submit that Yamazaki Claims 20 and 37 and Takahashi Claims 10 and 33 would have been obvious over Count 2 in view of Togino '588.

(3) Yamazaki Claims 75, 92, and 110

Yamazaki Claims 75, 92, and 110 differ from Count 2 in the aspects discussed above with respect to Yamazaki Claims 20, 37, and 55 from which they depend, and further in that the claims recite acrylic resin or glass as the medium. However, Applicants respectfully submit that the use of

plastic and glass materials was known in the art, as discussed above with reference to Ellis and Ingleton. For this reason and those advanced above with respect to Yamazaki Claims 20, 37 and 55, Applicants submit that Yamazaki Claims 75, 92 and 110 would have been obvious over Count 2 in view of Togino '588, and either Ellis or Ingleton.

c. Count 3

Applicants respectfully submit that Yamazaki Claims 22, 38, 57, 77, 93, and 112, and Takahashi Claims 12 and 34 correspond to Count 3, as follows:

(1) Yamazaki Claim 57

Yamazaki Claim 57 differs from Count 3 in that Yamazaki Claim 57 further requires that the rotationally asymmetric curved surface is formed from a configuration having an aberration correcting action to correct decentration aberrations caused by reflection in the prism member. However, Applicants respectfully submit that it was known in the art to form a rotationally asymmetric curved surface so as to address trapezoidal distortion of an eccentric system, as discussed above with reference to Togino '588. Accordingly, Applicants respectfully submit that Yamazaki Claim 57 would have been obvious over Count 3 in view of Togino '588



(2) Yamazaki Claims 22 and 38 and Takahashi Claims 12 and 34

Yamazaki Claims 22 and 38 and Takahashi Claims 12 and 34 differ from Count 3 in the aspects discussed above with respect to Yamazaki Claim 57 and further in that they differ in the preamble (with Yamazaki Claim 22 and Takahashi Claim 12 reciting an "image-forming system which forms an image of an object", and Yamazaki Claim 38 and Takahashi Claim 34 reciting an "ocular optical system arranged to lead an image formed on an image plane to an observer's eyeball", whereas the count recites an "optical system"), and in that Takahashi Claims 12 and 34 recite that the refractive index is greater than one. However, for reasons advanced above, Applicants submit that these are distinctions without a patentable difference; accordingly, Applicants submit that Yamazaki Claims 22 and 38 and Takahashi Claims 12 and 34 would have been obvious over Count 3 in view of Togino '588.

(3) Yamazaki Claims 77, 93, and 112

Yamazaki Claims 77, 93, and 112 differ from Count 3 in the aspects discussed above with respect to Yamazaki Claims 22, 38, and 57 from which they depend, and further in that the claims recite acrylic resin or glass as the medium. However, Applicants respectfully submit that the use of plastic and glass materials was known in the art, as discussed above with reference to Ellis and Ingleton. For this reason and those advanced above with respect to Yamazaki

Claims 22, 38, and 57, Applicants submit that Yamazaki Claims 77, 93, and 112 would have been obvious over Count 3 in view of Togino '588, and either Ellis or Ingleton.

d. Count 4

Applicants respectfully submit that Yamazaki Claims 43, 44, 98, and 99, and Takahashi Claims 39 through 42 correspond to Count 4, as follows:

(1) Yamazaki Claim 43

Yamazaki Claim 43 is identical to Count 4.

(2) Takahashi Claim 39

Takahashi Claim 39 differs from Count 4 in that whereas the count recites an optical system comprising a prism member, Takahashi Claim 39 recites "in a finder optical system comprising an objective optical system for forming an object image; an image erecting optical system for erecting said object image; and an ocular optical system for observing said object image; the improvement which comprises at least one prism member".

However, Applicants respectfully submit that it was known in the art to provide a finder optical system having an objective optical system, image erecting optical system, and ocular optical system, as shown by Koyama, et al. (e.g., Fig. 7, objective lens 21, prism unit 23 for providing a non-inverted erect image, and eyepiece lens 25.)

Accordingly, Applicants respectfully submit that Takahashi Claim 39 would have been obvious over Count 4 in view of Koyama, et al.

(3) Yamazaki Claim 44 and Takahashi Claim 40

Yamazaki Claim 44 and Takahashi Claim 40 differ from Count 4 in the aspects discussed above with respect to Yamazaki Claim 43 and Takahashi Claim 39 from which they depend, and further in that they recite that the prism member is arranged such that one of the surfaces having a reflecting surface and one of the surfaces having a transmitting action are formed from an identical surface.

However, Applicants respectfully submit that it was known in the art to provide a reflecting/transmitting surface, as shown by Koyama, et al. (e.g., Fig. 7, surface 27a (27d)). For this reason, and the reasons advanced above with respect to Yamazaki Claim 43 and Takahashi Claim 39, Applicants respectfully submit that Yamazaki Claim 44 and Takahashi Claim 40 would have been obvious over Count 4 in view of Koyama, et al.

(4) Takahashi Claims 41/(39-40) and 42/41/(39-40)

Takahashi Claims 41/(39-40) and 42/41/(39-40) differ from Count 4 in the aspects discussed above with respect to Takahashi Claims 39 and 40 from which they depend and further in that they respectively recite (a) a camera apparatus which has the finder optical system, and (b) such a

camera apparatus where a photographic optical system is provided separately from the finder optical system.

However, Applicants respectfully submit that it was known in the art to provide a finder optical system in a camera, and to have a photographic optical system separate from the finder optical system, as shown by Koyama, et al. (e.g., col. 3, line 43; col. 5, line 24.) For this reason, and for the reasons advanced above with respect to Takahashi Claims 39 and 40, Applicants respectfully submit that Takahashi Claims 41/(39-40) and 42/41/(39-40) would have been obvious over Count 4 in view of Koyama, et al.

(5) Yamazaki Claims 98 and 99

Yamazaki Claims 98 and 99 differ from Count 4 in the aspects discussed above with respect to Yamazaki Claims 43 and 44 from which they depend, and further in that the claims recite acrylic resin or glass as the medium. However, Applicants respectfully submit that the use of plastic and glass materials was known in the art, as discussed above with reference to Ellis and Ingleton. For this reason and those advanced above with respect to Yamazaki Claims 43 and 44, Applicants submit that Yamazaki Claims 98 and 99 would have been obvious over Count 4 in view of Ellis or Ingleton (Yamazaki Claim 98), or Count 4 in view of Koyama, et al. and further in view of Ellis or Ingleton (Yamazaki Claim 99).

D. Support for Yamazaki Claims

The following establishes that the terms of Yamazaki Claims 11 through 124 are supported by the present application.

(1) Yamazaki Claim 45

Yamazaki Claim 45 is an independent claim, which Applicants respectfully submit is supported as shown by the following Table F:

TABLE F

| Yamazaki Claim 45   | support in present application  |
|---|---|
| [45(a)] An optical system comprising a prism member,  | [45(a)] An optical system including a prism member 3 (first optical member 3a) is disclosed. (See, e.g., p. 1, lines 5-8; p. 6, line 7. See, e.g., Figs. 1A through 8B, 12A through 19B, and 23A and 23B; p. 6, lines 11-21; p. 23, line 17 through p. 24, line 1; p. 49, lines 77 through p. 50, line 14.)   |
| [45(b)] wherein said prism member has a first surface and a second surface, which face each other across a medium, so that light rays entering said prism member are reflected at least twice in said prism member, | [45(b)] The prism member includes a totally reflecting face 1 and a concave mirror 2 -- each of which reflects the light -- and is made of, e.g., acrylic resin or glass. (See, e.g., Figs. 1A through 8B, 12A through 19B, and 23A and 23B; p. 6, lines 11 through 21; p. 23, lines 17 through 23; p. 27, line 14 through p. 28, line 11; p. 49, line 27 through page 50, line 5; Numerical Examples 1 through 9.) |

[45(c)] wherein both said first surface and said second surface are curved surface configurations, and at least one of the curved surface configurations is formed from a rotationally asymmetric curved surface.

[45(c)] Both the totally reflecting face 1 and the concave mirror 2 may be toric aspherical surfaces or anamorphic aspherical surfaces (i.e., rotationally asymmetric curved surfaces). (See, e.g., Figs. 1A through 8B, 12A through 19B, and 23A and 23B; Numerical Examples 1 through 9; p. 16, lines 17-26 ("The configuration shown in Figs. 2A and 2B employs toric aspherical surfaces in the concave mirror and the totally reflecting face. The configuration shown in Figs. 3A and 3B employs anamorphic aspherical surfaces in all of the concave mirror, totally reflecting face, and light entrance face. Also the configuration shown in Figs. 4A to 5B employ anamorphic aspherical surfaces in all the optical faces.").)

(2) Yamazaki Claims 46 through 51 and 62

Yamazaki Claims 46 through 51 and 62 ultimately depend from Yamazaki Claim 45 and further recite one or more of the following features, which are supported as set forth in the following Table G:

TABLE G

| Claim | Feature   | Support  |
|-------|---|--|
| 46    | The prism member has a third surface which faces the first and second surfaces across the medium. | The prism member has an entrance surface 5. (See, e.g., Figs. 1A, 1B.) |

|    |   |   |
|----|---|---|
| 47 | The first and second surfaces have a reflecting action and the third surface has a transmitting action.   | Totally reflecting face 1 both reflects and transmits light, and entrance surface 5 transmits light. (See, e.g., p. 6, lines 16-21; Fig. 1B.)   |
| 48 | The first surface has both a transmitting action and a reflecting action.   |   |
| 49 | The first surface is totally reflecting.  |   |
| 50 | Light enters the prism member by passing through the third surface, and is reflected by the first and second surfaces, and exits by passing through the first surface.            | Light enters via entrance face 5, is totally reflected by totally reflecting face 1, further reflected by concave half mirror 2, and transmitted by totally reflecting face 1. (See, e.g., p. 6, lines 14-21; Fig. 1B.) |
| 51 | Light enters the prism member by passing through the first surface, and is reflected by the second surface and the first surface, and exits by passing through the third surface. | Light is transmitted by the front face 1, reflected by concave face 2 and totally reflecting face 1, and then is transmitted by entrance face 5. (See, e.g., p. 26, line 24 through p. 27, line 5; Fig. 9.)             |
| 62 | The prism member has a mirror coating.  | See, e.g., p. 6, lines 24-25 (disclosing a "half mirror"); p. 7, line 3 (disclosing a "mirror")   |

(3) Yamazaki Claims 52 through 61, 64, 65, and 122  
 Claims 52 through 61, 64, 65, and 122 ultimately depend from various of Claims 45 through 51 and further recite one or more of the following features, which

Applicants submit are supported as set forth in the following  
Table H:

TABLE H

| Claim     | Feature   | Support  |
|-----------|---|--|
| 52        | The rotationally asymmetric curved surface is formed from a configuration having an aberration correcting action to correct decentration aberrations caused by reflection in the prism member.  | A toric or anamorphic aspherical surface with variable refractive power depending on the azimuthal angle is employed in the front face 1, the concave face 2, and the entrance face 5, whereby satisfactory correction is attained for the eccentric aberration generated when the angle between the incident light and the emerging light of the concave mirror 2 is made large. (See, e.g., p. 28, lines 12-23; p. 16, lines 15-26; p. 10, lines 1-8 and 23-27, wherein the first, second, and third surfaces correspond to surfaces 1, 2, and 5.) |
| 53        | The second surface is formed from the rotationally asymmetric curved surface.   |  |
| 54        | The first surface is formed from the rotationally asymmetric curved surface.  |  |
| 55        | The third surface is formed from the rotationally asymmetric curved surface.  |  |
| 61,<br>65 | The first surface is formed from a rotationally asymmetric curved surface having an aberration correcting action to correct decentration aberrations caused by reflection in the prism member, so that light from the object is subjected to the aberration correcting action when passing through the first surface and is also subjected to the aberration correcting action when reflected by the first surface. |  |



|            |   |   |
|------------|---|---|
| 56         | The prism member has a mirror coating.  | See Claim 62.   |
| 57         | The first surface is concave toward the object.   | See, e.g., p. 29, lines 4 and 13.   |
| 58         | The second surface is concave toward the medium.  | Concave mirror 2 is so formed. (See, e.g., p. 9, line 25; Fig. 1B.)   |
| 59,<br>60  | The field angle in a horizontal direction is different than (Claim 59) or larger than (Claim 60) the field angle in the vertical direction.         | See, e.g., p. 7, lines 7 through 10 (viewing angle in the horizontal direction of $\pm 16.8^\circ$ and in the vertical direction of $\pm 11.4^\circ$ ). |
| 64,<br>122 | An optical member is disposed closer to an object than the prism member (Claim 64), and the optical member has two refractive surfaces (Claim 122). | See, e.g., Fig. 13, optical member 10.  |

(4) Yamazaki Claims 11 through 26, 63, and 121, and Yamazaki Claims 27 through 42

Yamazaki Claims 11 through 26, 63, and 123 (the "Group A Claims") and Claims 27 through 42 (the "Group B Claims") have been formulated upon the basis of Yamazaki Claims 45 through 62, 64, 65, and 122 (the "Base Claims"), and, as discussed above, differ from the Base Claims in that the Group A Claims recite in the preamble:

(a) an image-forming optical system which forms an image of an object; and

the Group B Claims recite in the preamble:

(b) an ocular optical system arranged to lead an image formed on an image plane to an observer's eyeball,

whereas the Base Claims are directed to an "optical system". Applicants respectfully submit that feature (a) is supported by, e.g., Fig. 8B, which shows forming an image of the eye, and that feature (b) is supported by, e.g., Fig. 1B, which shows that the image is formed by display means 4.

(5) Yamazaki Claims 43 and 44

Yamazaki Claim 43 is an independent claim which Applicants submit is supported as shown by the following

Table I:

TABLE I

| Yamazaki Claim 43   | support in present application  |
|---|---|
| [43(a)] An optical system comprising a prism member,  | See [45(a)].  |
| [43(b)] wherein said prism member has<br>two surfaces having a reflecting action to reflect light in said prism member, and<br>two surfaces having a transmitting action to transmit light, | [43(b)] The prism member 3/3a includes<br>two reflecting surfaces, totally reflecting face 1 and concave mirror 2, and<br>two transmitting surfaces, entrance surface 5 and totally reflecting face 1 (which both reflects and transmits light).<br>(See [45(b)] and [46].) |
| [43(c)] wherein said prism member has at least one rotationally asymmetric curved surface.  | [43(c)] See [45(c)].  |

Yamazaki Claim 44 depends from Yamazaki Claim 43 and further recites that one of the reflecting surfaces and one of the transmitting surfaces are formed from an identical surface, which Applicants submit is supported by, e.g., totally reflecting face 1 (Fig. 1B).

- (6) Yamazaki Claims 66 through 74, 76, 78 through 91, 94 through 97, 100 through 109, 111, and 113 through 120, 123, and 124

Yamazaki Claims 66 through 74, 76, 78 through 91, 94 through 97, 100 through 109, 111, and 113 through 120, 123, and 124 have been formulated upon the basis of Yamazaki Claims 11 through 19, 21, 23 through 36, 39 through 42, 45 through 54, 56, 58 through 65, 121, and 122 from which they depend, and further recite acrylic resin or glass as the medium, which Applicants submit is supported at, e.g., p. 17, line 5.

D. Benefit of earlier applications for priority

Applicants are entitled to the benefit of the following applications (1) through (4) for proposed Counts 1 through 4, as discussed in more detail below:

(1) U.S. Patent Application No. 08/959,285 filed October 24, 1997 (the "'285 Application");

(2) U.S. Patent Application No. 08/478,688 filed June 7, 1995 (the "'688 Application");

(3) Japanese Patent Application No. 6-204268 filed August 5, 1994 (the "'268 Application"); and

(4) Japanese Patent Application No. 6-130301 filed June 13, 1994 (the "'301 Application").

#### The '285 and '688 Applications

In particular, the present application is a divisional application under 37 CFR 1.53(b) of the '285 Application, which is a continuation application under former 37 CFR 1.62 of the '688 Application, and the specification and drawings of these applications as filed are identical, and each of the '285 Application and the '688 Application constitutes a constructive reduction to practice of the subject matter of proposed Counts 1 through 4, which have been formulated upon the basis of Yamazaki claims that are submitted by Applicants to be fully supported, as discussed above in detail.

#### The '301 and '268 Applications

##### Count 1

As shown by the following Table J, the terms of proposed Count 1 are also submitted by Applicants to be supported by the '301 and '268 Applications, thus establishing that each such application constitutes a constructive reduction to practice of the subject matter of the proposed count (references in the Tables are to the pages

and line numbers of the sworn English translations filed January 25, 2001).

TABLE J

| Count 1  | support in '301 Application  | support in '268 Application   |
|--|--|---|
| [1(a)] An optical system comprising a prism member,  | [1(a)] An optical system including a first optical (prism) member 3a is disclosed. (See, e.g., p. 7, [0010], lines 2-3 and 7-10; Figs. 1-7.)   | [1(a)] An optical system including a prism member is disclosed. (See, e.g., p. 12, [0008]; p. 18, [0020]; Figs. 1-3 and 6-12.)  |
| [1(b)] wherein said prism member has a first surface and a second surface, which face each other across a medium, so that light rays entering said prism member are reflected at least twice in said prism member, | [1(b)] The first optical member 3a has a total reflection surface 1 and a concave half mirror 2, both of which reflect the light, and the first optical member 3a is made of acrylic resin or glass. (See, e.g., p. 7, [0010], lines 10-17; Numerical Examples 1-4; Figs. 1-7; p. 19, [0037].) | [1(b)] The prism member 3 has a front face 1 effecting total reflection in a part and a concave face 2 having a mirror-reflecting surface across a medium. (See, e.g., p. 18, [0020]; p. 20, [0022]; Numerical Examples 1-5; Figs. 1-3 and 6-12.) |

|   |  |  |
|---|--|--|
| <p>[1(c)] wherein both said first surface and said second surface are curved surface configurations, and at least one of the curved surface configurations is formed from a rotationally asymmetric curved surface.</p> | <p>[1(c)] Both the totally reflection surface 1 and the concave mirror 2 may be toric aspherical surfaces or anamorphic aspherical surfaces (i.e., rotationally asymmetric curved surfaces). (See, e.g., p. 8, [0014], line 9 to p. 9, line 2; Figs. 1-5; Numerical Examples 1-4; p. 19, [0035] ("The configuration shown in Fig. 2 employs toric aspherical surfaces in the concave mirror and the total reflection surface. The configuration shown in Fig. 3 employs anamorphic aspherical surfaces in all of the concave mirror, total reflection surface and light entrance face. Also the configurations shown in Figs. 4 and 5 employ anamorphic aspherical surfaces in all the optical surfaces.").)</p> | <p>[1(c)] Numerical Examples 1-5; see also, e.g., p. 24, [0030]; p. 13, [0010]; p. 15, [0015].</p> |
|---|--|--|

### Counts 2 and 3

Counts 2 and 3 have been formulated upon the basis of Count 1, but further recite features which Applicants respectfully submit find support in the '301 and '268 Applications as shown by the following Table K:

TABLE K

| additional feature<br>and count   | support in '301<br>Application  | support in '286<br>Application   |
|---|---|--|
| The third surface<br>is formed from the<br>rotationally<br>asymmetric curved<br>surface (Count 2).  | The configurations<br>of Figs. 3-5<br>employ an<br>anamorphic<br>aspherical surface<br>(i.e., a<br>rotationally<br>asymmetric curved<br>surface) for<br>entrance surface<br>5. (See, e.g., p.<br>19, [0035], lines<br>6-12; Numerical<br>Examples 3-5;<br>Figs. 3-5.) | See, e.g.,<br>Numerical Examples<br>3-5.   |
| The first surface<br>is formed from a<br>configuration<br>having a concave<br>surface directed<br>toward the outside<br>of the medium<br>(Count 3). | See, p. 11,<br>[0019]; pp. 9-10,<br>[0016]; Numerical<br>Examples 1-4;<br>Figs. 1-4.  | See, e.g.,<br>Numerical Examples<br>1-5; see also,<br>e.g., p. 25,<br>[0032]-[0033]. |

For these reasons, and those set forth above with respect to Count 1, Applicants submit that each of the '268 and '301 Applications constitutes a constructive reduction to practice of Counts 2 and 3.

Count 4

As shown by the following Table L, the terms of proposed Count 4 are also submitted by Applicants to be supported by the '301 and '268 Applications, thus establishing that each such application constitutes a

constructive reduction to practice of the subject matter of the proposed count.

TABLE L

| Count 4  | support in '301 Application   | support in '268 Application  |
|--|---|--|
| [4(a)] An optical system comprising a prism member,  | [4(a)] See [1(a)].  | [4(a)] See [1(a)].   |
| [4(b)] wherein said prism member has two surfaces having a reflecting action to reflect light in said prism member, and two surfaces having a transmitting action to transmit light, and | [4(b)] The prism member has two reflecting surfaces, total reflection face 1 and concave half mirror 2, and two transmitting surfaces, entrance surface 5 and total reflection face 1 (which both reflects and transmits light). (See, e.g., p. 7, [0010], lines 10-17; Figs. 1-5; Numerical Examples 1-4.) | [4(b)] The prism member has two reflecting surfaces, front face 1 and concave face 2, and two transmitting surfaces, entrance face 5 and front face 1 (which both reflects and transmits light). (See, e.g., p. 12, [0009]; p. 18, [0020]; p. 20, [0022]; Figs. 1-3 and 6-12; Numerical Examples 1-5.) |
| [4(c)] wherein said prism member has at least one rotationally asymmetric curved surface.  | [4(c)] See [1(c)].  | [1(c)] See [1(c)].   |



E. Summary of proposed interference

The following Tables M and N summarize Applicants' proposal for the interference, with Counts 1 through 4 as proposed above:

TABLE M

|  |   |
|--|---|
| Applicants<br>(Senior Party):          | Shoichi Yamazaki and Takeshi Nishimura  |
| Application No.:                       | U.S. Patent Application No. 09/768,306<br>filed January 25, 2001  |
| For:                                   | HEAD-UP DISPLAY DEVICE WITH<br>ROTATIONALLY ASYMMETRIC CURVED SURFACE<br>(AS AMENDED)   |
| Assignee:                              | Canon Kabushiki Kaisha  |
| Accorded Benefit<br>(for all Counts):  | (1) U.S. Patent Application No.<br>08/959,285 filed October 24, 1997;<br>(2) U.S. Patent Application No.<br>08/478,688 filed June 7, 1995;<br>(3) Japanese Patent Application No.<br>6-204268 filed August 5, 1994; and<br>(4) Japanese Patent Application No.<br>6-130301 filed June 13, 1994. |
| Claims<br>corresponding to<br>Count 1: | 11-19, 21, 23-36, 39-42, 45-54, 56,<br>58-74, 76, 78-91, 94-97, 100-109, 111,<br>and 113-124  |
| Claims<br>corresponding to<br>Count 2: | 18, 35, 53, 75, 92, and 110   |
| Claims<br>corresponding to<br>Count 3: | 22, 38, 57, 77, 93, and 112   |
| Claims<br>corresponding to<br>Count 4: | 43, 44, 98, and 99  |

TABLE N

|  |   |
|--|---|
| Patentee<br>(Junior Party)             | Koichi Takahashi  |
| Application No.:                       | U.S. Patent Application No. 09/095,723<br>filed June 11, 1998, Patent No.<br>6,018,423 granted January 25, 2000 |
| For:                                   | OPTICAL SYSTEM AND OPTICAL APPARATUS  |
| Assignee:                              | Olympus Optical Co., Ltd.   |
| Claims<br>corresponding to<br>Count 1: | 1-9, 11, 13, 14, 16, 17, 22-32, and 35-38   |
| Claims<br>corresponding to<br>Count 2: | 10 and 33   |
| Claims<br>corresponding to<br>Count 3: | 12 and 34   |
| Claims<br>corresponding to<br>Count 4: | 39-42   |

CONCLUSION

Since the requirements of 37 CFR 1.607 have been satisfied, Applicants request that an interference, with Counts 1 through 4 as proposed above, be declared between the present application and the Takahashi '423 patent. Applicants also respectfully request senior party status by virtue of the earlier filing date. In addition, Applicants respectfully request benefit for priority of the filing dates of the '285, '688, '301, and '268 Applications for all proposed Counts.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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